

OKLAHOMA
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Better Seed Potatoes For Oklahoma

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BETTER SEED POTATOES FOR OKLAHOMA

Low yields of Irish potatoes produced each year in Oklahoma are caused more from seed than from cultural mistakes. Although small seed pieces and lack of treating for diseases often reduce yields, most of the small yields are due to using seed that has "run out". With little care and at a small expense potato growers can select better seed and use better methods of cutting the seed with results that will sometimes double the yield.

"RUNNING OUT" OF SEED

Seed used over and over again each year results in diminished yields in proportion to the number of generations the seed has been used. New seed of stronger strains must be substituted occasionally. The Connecticut Experiment Station (Bul. 107) conducted experiments testing new seed with seed selected over and over for several generations with results as shown in the following table:

"New" seed	250 bu. per acre
"One year old" seed	196 bu. per acre
"Two-year old" seed	138 bu. per acre
"Three-year old" seed	163 bu. per acre
"Four-year-old" seed	118 bu. per acre

This table shows that it hardly pays to use your own seed even for one generation but to secure new seed each year.

This running out of seed has lately been attributed largely to a disease called mosaic. This disease does not bear spores that can be seen as is the case with most diseases but is held in the sap of the plant. Transferring sap from one plant to another or objects coming in contact with different plants spread the disease. The Minnesota Station (Bul. 197) carried on extensive experiments in regard to the spread of mosaic and came to the following conclusions: "Mosaic dwarf is perpetuated from year to year by planting tubers from diseased plants. It can be transmitted artificially by transferring the juice of diseased plants to healthy plants, by grafting a portion of a diseased plant on a healthy plant, and by grafting a diseased tuber on a healthy tuber. The virus did not spread through the soil when healthy and diseased plants were grown side by side in the same box and their roots allowed to intermingle. Field experiments with insect cages further indicate that infection does not occur through the soil. Healthy plants did not become infected when planted in soil which previously grew diseased plants. Infection of healthy plants in the field has been prevented by excluding from the plants insects which appear later than July 5th".

From the above statements, it appears that practically the only means of infecting plants is by planting infected seed pieces or by spreading from neighboring infected plants, mostly by insects.

The disease works down the stem to the tubers and is carried over in that way. On the plants, the mosaic causes the leaves to become mottled, light green to yellow in some cases and dark green in others and the edges of the leaves are often turned under. It first becomes visible on plants when six to eight inches high in cases where the seed were infected. Plants grown from uninfected seed seldom show signs until late in the growing season. As will be shown later the yield is decreased to a large extent if the plants are infected early in the season.

MEANING OF CERTIFIED SEED

Mosaic is more common in southern than in northern states. It spreads rapidly and unless infected plants are destroyed when they first show signs of the disease, the disease will probably spread over the entire field. A plant once infected can not be cured by spraying or fertilizers nor can the disease be prevented by those methods since the trouble is inside of the plant. *The only way to prevent spread is to control insects and cut out infected plants as soon as they appear.*

Where certified seed is grown the growers cut out the diseased plants and at the end of the season the Experiment Station of that state certifies or guarantees the seed as being free or practically free of mosaic. Cutting out a large part of the plants accounts for the increase in price of certified over ordinary seed. Buying certified seed is the only safe way of securing a good yield since, as will be shown later, seed containing mosaic will produce lower yields. Plants grown in Oklahoma from certified seed will generally be slightly infected before the end of the season and carried over in the seed to the extent that the next year's crop will be somewhat reduced. The second generation should not be used as seed; however, commercial growers often practice planting spring-grown seed for the fall crop and using the fall crop for seed the following spring.

MOSAIC REDUCES YIELD AND SIZE OF TUBERS

The Department of Horticulture of the Oklahoma Agricultural Experiment Station in 1922 completed a series of experiments comparing certified seed with the average seed bought on the market in Oklahoma. Ten plots were planted to certified seed obtained from ten different places in Nebraska, Wisconsin, Wyoming and Minnesota. Two plots were planted to ordinary seed bought on the market. The results are shown in the following table:

Seed Grown	Plot No.	Percent Mosaic May 25	Yield per acre, bu. June 20
Wyoming	1	24	91.5
Nebraska	2	31	85.5
Nebraska	3	15	148.2
Nebraska	4	6	155.8
Nebraska	5	22	147.3
Wisconsin	6	19	137.4
Wisconsin	7	36	100.7
Wisconsin	8	25	113.4
Wisconsin	9	23	115.6
Minnesota	10	24	125.4
	Check	20	132.4
	Check	18	109.6

The variety used was Bliss Triumph.

The table does not show the increase of mosaic infections later in the season. The yield of the crop from certified seed ranged from 85.5 to 155.8 bushels with an average of 122.0 bushels per acre, while the seed bought on the market ranged from 109.6 to 132.4 bushels with an average of 121.0 bushels per acre. The percentages of infection in this table are unusually high due to adjacent fields of infected plants from seed not certified.

At the same time and on adjacent ground an experiment was conducted testing various kinds of fertilizers. The eight plots fertilized yielded from 35.2 to 76.7 bushels with an average of 59.15 bushels per acre and the yield of the unfertilized plots was 35.7 and 50.0 bushels with an average of 42.85 bushels per acre. Again bear in mind that these seed were not certified but bought on the average market and yielded much lower than the plots of certified seed mentioned above.

The above tables show that the average seed may or may not be worth planting, but that the chances are largely against high yields from seed not certified. Certified

seed is an insurance. The plants of the fertilizer experiment all showed signs of mosaic when the plants of the certified seed were practically free and the yield was reduced accordingly. The plants from the certified seed were healthy and green at digging time while the mosaic infected plants of the fertilizer experiment were brown and dying fast. Furthermore, the crop of the fertilizer experiment consisted of a larger percentage of unmarketable potatoes and the potatoes that were marketable were smaller than those of the crop from the certified seed. From the marketable potatoes of the crop from certified seed, it took an average of 375 tubers to make a bushel while in the fertilizer experiment an average of 423 were necessary.

HOW TO OBTAIN CERTIFIED SEED

Although certified seed from some states have proved better than from others in our experiments, it is impossible to say that seed from any certain state should be grown as good seed may be obtained from several states. Formerly Maine seed was considered best but the spread of mosaic into that state has lowered its reputation as a state from which to obtain good certified seed. At present Nebraska, Wisconsin and Minnesota seem to produce the best seed. Our experiments show that of crops grown in Oklahoma, those from Nebraska seed yielded best with those from Wisconsin a close second. This year the seed from Nebraska yielded 141.8 bushels while the seed from Wisconsin yielded 129.2 bushels per acre.

Cooperative associations or groups of farmers can arrange to procure seed in carload lots from the growers of the several states. Lists of these growers may be secured from the Experiment Station of the state where the seed is grown. The local produce man also handles certified seed although that is not the practice in Oklahoma at present. Seed is not certified as free from mosaic unless so labeled by the state in which it was grown. Seed from northern states should be shipped in the fall and stored in Oklahoma over winter. Such seed is cheaper and will not be frozen or delayed in shipping.

SELECTING YOUR OWN SEED

As mentioned before, the grower should secure certified seed free from mosaic each year. If the progeny of this crop is used for seed, the hill method of seed selection should be used and even then a slightly reduced yield may be expected. If the seed from this second crop is used, a large reduction in yield will invariably occur, excepting in seed from the fall crop.

If the grower does save one generation of his own seed, he should go into the field at digging time and obtain seed only from hills free from mosaic and containing high yields. Experiments have shown that seed whether large or small, if they are obtained from high yielding hills will tend to produce high yielding hills the next year and that small potatoes are just as good as large cut potatoes of the same weight. The grower should not collect his entire crop and then pick out the best potatoes for seed. Many times such potatoes are from low yielding hills and will not produce high yields. New York has recently published work along this line (Bul. 491) as follows:

"In the first experiment, conducted in 1906, the four rows planted with whole small tubers out-yielded the alternating four rows planted with pieces of large tubers at the rate of 21.4 bushels of marketable tubers and 8.6 bushels of small tubers per acre.

In the second experiment, conducted in 1920, there were twenty rows of one hundred plants each. The ten odd numbered rows were planted with pieces of large tubers, while the ten even numbered rows were planted with whole small tubers. The rows planted with whole small tubers made the better showing in every respect—the stand was better, the early growth of the plants was more rapid, fewer of the plants were affected with leaf roll, and the yield of both large and small tubers was greater. The rows planted with whole small tubers out-yielded those planted with pieces of large tubers at the rate of about seventeen bushels per acre.

The principal conclusion to be drawn from the experiment is that for seed purposes uncut tubers between one and two ounces in weight are at least as good as

and probably a little better than pieces of equal weight cut from large tubers of the same plant."

The potato grower of Oklahoma usually uses a small piece to plant and generally plants eight or nine bushels per acre. Experiments have shown that twelve to fifteen bushels of seed to the acre will more than pay the farmer for the extra seed. Although a one-eye piece will often give high yields, it is much safer to have two good eyes to depend on. The pieces should be blocky rather than thin.

The Missouri Experiment Station (Cir. 106) has done some work on the size of seed pieces as shown in the following quotations:

"Experiments here on size of seed piece and whole vs. cut seed pieces have been conducted with the Early Ohio variety. The smallest size of seed piece was about 2-3 ounce and the largest size nearly 2 ounces. As was to be expected the total yield increased with the size of the seed in every case. The increase is greatest from the 2-3 ounce to the 1 ounce class, becoming smaller with further increase in size of seed piece. The larger seed pieces produced a higher percentage of culls. The increase in yield of No. 1 potatoes from the 2-3 ounce to the 1 ounce seed pieces is considerable, but the gain in the No. 1 grade beyond this point is slight. This is important since the yield of the No. 1 grade practically determines the value of the crop.

Concerning cut vs. whole seed pieces, we have here an opportunity to make a direct comparison between seed pieces of the two types which are of the same weight. In total yield, cut seed produced less than whole seed in nearly every case with the spring home grown class of seed; but in the northern grown seed the reverse is true. In yield of No. 1 grade, the whole seed gave a less favorable showing; for in most cases, the cut seed produced the greater yield of No. 1 grade in both classes."

The above experiments show that whether or not the yield of small whole tubers is larger than the cut tubers of the same size, the small whole tubers one ounce or more in weight make good yields and can profitably be used as seed.

The rate to plant seed seems to be about eleven bushels per acre which is more than generally planted in Oklahoma. A one-ounce piece seems to be the most profitable size of seed piece and these fifteen inches apart in rows three and one-half feet apart will run about eleven bushels per acre.

Our own experiments as well as those of other stations show that seed used one year usually becomes infected with mosaic to the extent that the yield of succeeding generations is reduced and that seed bought on the market not certified may or may not be infected. The seed "certified" by an experiment station is the only seed known to be free of mosaic infection and therefore most certain in placing the grower in a safe position of securing a good yield.

VARIETIES FOR OKLAHOMA

In every state there are a few varieties of potatoes better adapted to the conditions of that state. Oklahoma growers should use some early variety as Bliss Triumph, Irish Cobbler, or Early Ohio. For home use, many prefer the red variety of Bliss Triumph while others use the white Irish Cobbler. The latter will generally outyield the former and where the price is the same it is usually more profitable to grow the Cobbler for commercial purposes.

SEED TREATMENT PROFITABLE

Another factor that cuts down the yield of potatoes in Oklahoma is the lack of the practice of dipping seed to control such fungus diseases as Rhizoctonia and scab. Since these two diseases are the only ones controlled by dipping and these only where they appear on the surface of the tuber, it is often impractical to dip seed especially on a large scale. It is better to use only seed free from such diseases. Where the disease is bad on the tubers, 4 ounces of corrosive sublimate is used in 30 gallons of water but where a slight infection occurs a pint of formalin may be used instead. Either may be obtained from a drug store. The material is dissolved in warm water and added to 30 gallons of water in a wooden barrel. A bushel or more of potatoes is placed in a crate and dipped for 30 minutes (2 hours

if formalin is used) and then spread out to dry. After ten bushels have been dipped, a new solution should be used or the old one strengthened. This controls diseases on the skin of the potatoes but does not control organisms that penetrate beneath the skin. These should be removed. Potatoes dipped are poisonous and unfit for edible purposes. The tubers should never be cut before dipping.

CARE OF SEED

Often seed potatoes are cut several days in advance of planting. Such cut seed heat and deteriorate rapidly when stored in bulk or in sacks. Cut potatoes should be kept spread out on a floor about six inches deep and turned over daily for about five days until the cut surfaces are dried or until ready for planting. Cutting seed immediately before using may be practiced with good results.

THE FALL CROP

Although a fall crop of potatoes is often planted in Oklahoma and this crop used for seed the following spring, as a rule, this crop will not pay except in sections where sufficient summer and fall rains are assured. Where the fall crop is grown, the seed should be planted about July 1st, providing the ground can be plowed at that time. Seed is generally put in cold storage and used for the fall crop although some have secured good results by planting culls from the spring crop directly after harvesting. The fall crop will generally produce better if planted on ground that has not produced a summer crop.

SUMMARY

- I. Many of the low yields of potatoes in Oklahoma are due to using run out seed selected on the farm or bought on the market.
- II. "Running out" of potatoes is attributed as due to a disease called mosaic. This disease is carried over winter in tubers and is spread in the field by insects. The disease lives in the sap and does not blow from one plant to another. It is not spread or carried over in the soil.
- III. Spraying to control insects will to a certain extent prevent the spread of mosaic in the field.
- IV. The only safe way of securing mosaic free seed is to secure seed certified by the Experiment Station or other agency of the state in which the seed was grown.
- V. Northern grown seed has been proven by Oklahoma and other southern stations as best for southern planting. Nebraska and Wisconsin seed have given best yields in Oklahoma experiments.
- VI. Bliss Triumph, Irish Cobbler and Early Ohio are the three varieties best adapted for Oklahoma planting.
- VII. Seed treatment controls Rhizoctonia and scab that might have lived over winter on the surface of the tubers. Use clean seed free from such spores.
- VIII. The fall crop is only advisable where rainfall during late summer and early fall is sufficient to mature a crop.
- IX. A one-ounce piece is perhaps the most economical size of seed piece to plant. Eleven bushels to the acre seems to be the most economical rate of planting seed.
- X. Whole tubers are as good for planting as a cut seed piece of the same weight.
- XI. Cut potatoes should not be stored in bulk because they will heat. They should be spread out about six inches deep and turned over daily for about five days and then sacked or stored in bulk. Potatoes may be planted immediately after cutting with better results.

